

Angiosperms of Sendirakillai Sacred Grove (SSG), Cuddalore District, Tamil Nadu, India

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ABSTRACT: We provide a checklist of Angiosperm alpha diversity of Sendirakillai Sacred Grove (SSG), a community conserved Tropical Dry Evergreen Forest (TDEF) fragment located on the Coromandel Coast of Cuddalore district (11°44'24" N, 79°47'24" E), Tamil Nadu, South India. Plant specimens were collected either with flowers or fruits and were identified and confirmed with available regional floras, revisions and monographs. In the present study, we have enumerated a total of 180 species and 2 varieties belonging to 151 genera distributed in 66 families from 29 orders according to Angiosperm Phylogeny Group III Classification. More than 30% of the total flora is represented by six families namely Fabaceae (14), Rubiaceae (12), Cyperaceae (10), Apocynaceae (8), Poaceae (8) and Euphorbiaceae (7). Three endemic species to India and three species that are confined to peninsular India and Sri Lanka are recorded from the sacred grove. Threats to the biodiversity of sacred grove are identified and conservation strategies are proposed.

INTRODUCTION

Sacred groves are patches of relict vegetation that are usually associated with folk deities and are conserved by the local communities based on taboos, religious beliefs and social sanctions (Gadgil and Vartak 1975). The plant richness and conservation potential of sacred groves are impressive enough to recognize them as 'Mini Biosphere Reserve' (Gadgil and Vartak 1975). Tropical Dry Evergreen Forest (TDEF) is one of the 16 major forest types in India and it is distributed in a narrow strip along the coast of Andhra Pradesh and Tamil Nadu. Champion and Seth (1968) state that these forests "*have been influenced by felling, lopping and browsing and have become irregular with open patches, and the thorny and unpalatable species have largely displaced the climax vegetation*". Considerable areas of this forest type have long been significantly degraded and fragmented (Selvamony *et al.* 1999) and nearly 80% of the remnants are conserved as sacred grove excluding a few Reserve Forests (RFs) and academic institution campuses. Hence, it should be considered as one of the endangered forest types in India. Plant Taxonomists and Ecologists have long been studying this forest type in different aspects such as assessment of its phytodiversity, documentation of ethnobotanically important plant species and analyzing its vegetation structure (Meher-Homji 1974; Parthasarathy and Karthikeyan 1997; Ramanujam and Kadamban 2001; Ramanujam and Cyril 2003; Reddy and Parthasarathy 2003; Venkateswaran and Parthasarathy 2003; Venkateswaran and Parthasarathy 2005; Parthasarathy *et al.* 2008; Udayakumar and Parthasarathy 2010). The present study was carried out with the following objectives:

(i) To prepare a checklist of plant species of the sacred grove;

(ii) To document threatened and endemic taxa of the sacred grove;

(iii) To identify the threats that prevail in the sacred grove and;

(iv) To suggest conservation strategies to maintain and strengthen the health of sacred grove.

MATERIALS AND METHODS

Study Site

Sendirakillai Sacred Grove (SSG) is a community (Vanniyas) conserved TDEF fragment located on the Coromandel Coast of Cuddalore district (11°44'24" N, 79°47'24" E), Tamil Nadu, South India (Figure 1 and 2). It occupies an area of 3.5 ha. The sacred grove receives an annual rainfall of about 1080 mm. The minimum day temperature of the sacred grove is 22.75°C and the maximum is 33.64°C. Folk deities such as Muniyanar, Muthalraathan, Ponniyamman and Iyanar are present in the sacred grove (Figure 3). There is a canal which carries excess water discharged from the Veeranam Lake and bisects the sacred grove. The vegetation of the sacred grove that occurs east of the canal is comparatively more open and more disturbed than that of western side, though this portion harbours all the four deities. The entire grove is surrounded by cashew plantations and agriculture and floriculture fields.

Data Collection

Field visits were conducted for a period of one year between June 2007 and May 2008 with regular intervals. Plants either with flowers or fruits were collected and identified or confirmed with available regional floras (Gamble 1915 – 1936; Bor 1960; Matthew 1982; 1983; 1988; Nair and Henry 1983; Henry *et al.* 1987; 1989; Karthikeyan *et al.* 1989; Sanjappa 1992; Balakrishnan and Chakrabarthy 2007; Karthikeyan *et al.* 2009), revisions (Thothathri 1987; Rajendran and Daniel 2002; Dutta and Deb 2004; Ansari 2008) and monographs (Sivarajan and

Pradeep 1996; Singh 2000; 2001; 2005). Photographs were taken for some of the more common, very rare, ethno-botanically valuable and endemic plant species in the sacred grove. Abbreviations of author's names of plant names strictly follow Brummitt and Powell (1992). The standard herbarium technique given by Fosberg and Sachet (1965) was followed for preparation of herbarium specimens. Herbarium specimens are deposited at Madras Christian College Herbarium (MCCH), Chennai, for further reference.

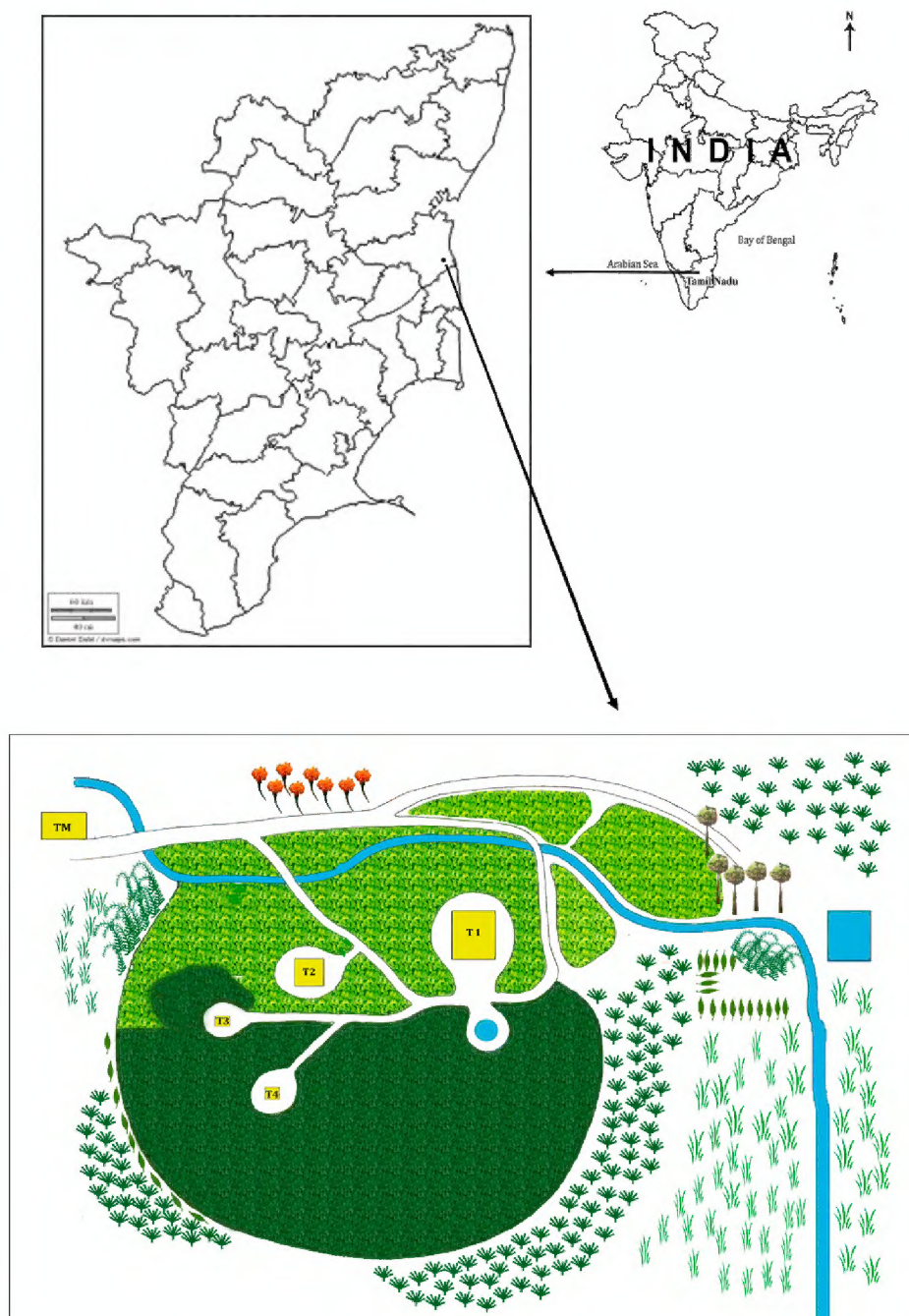


FIGURE 1. A Map showing the Sendirakillai Sacred Grove in Cuddalore district of Tamil Nadu, India (TM – Temple Mandabam, T1 - Muniyanar temple, T2 - Muthalraathan temple, T3 - Iyanar statue and T4 – Ponnamman statue).

RESULTS AND DISCUSSION

In the present study, a total of 180 species and 2 varieties belonging to 151 genera distributed in 66 families from 29 orders according to Angiosperm Phylogeny Group III Classification (2009) have been recorded from the sacred grove and are represented in table 1. More than 80% of the flora is represented by orders of Eudicot and Core Dicot, of which the major contributions are from Gentianales (12%), Malphigiales (10%), Lamiales (9%), Fabales (9%) and Caryophyllales (8%) of the sacred grove (Figure 4 and 5). Similarly more than half of the monocot taxa are represented by a single order namely Poales (56%). More than 30% of the total flora is represented by six families, viz., Fabaceae (14), Rubiaceae (12), Cyperaceae (10), Apocynaceae (8), Poaceae (8) and Euphorbiaceae (7). Occurrence of more members of Cyperaceae and Poaceae is probably due to the presence of agricultural and floricultural fields in the surrounding. An analysis on



FIGURE 2. A) Path way inside the Sacred Grove; B) A view of near by Cashew Plantation; C) Entrance view of the Sacred Grove; D) A Canal which bisects the Sacred Grove.

the life form composition of the flora shows that 65% are herbaceous that include herbs and herbaceous climbers

and the remaining 35% consist of woody life forms that include trees, shrubs and lianas (Figure 6). A total of eight orders namely Alismatales, Asparagales, Asterales, Celastrales, Cucurbitales, Dioscoreales, Magnoliales and Santalales are represented by two species each and four orders namely Liliales, Pandanales, Piperales and Zygophyllales are represented just by a single species. Genera such as *Cleome*, *Phyllanthus* and *Cyperus* are with maximum species diversity and are distributed with four species each. A scrutiny of literature (Ahmedullah and Nayar 1987; Nair and Nayar 1997; Singh 2000; Dutta and Deb 2004; Balakrishnan and Chakrabarthy 2007) pertaining to endemism reveals that three species namely *Jatropha tanjorensis*, *Leucas diffusa* and *Sansevieria roxburghiana* are endemic to India and three species, viz., *Capparis rotundifolia*, *Hedyotis graminifolia* and *Pamburus missionis* are endemic to peninsular India and Sri Lanka. The presence of these endemic species indicates the



FIGURE 3. A) Front view of Muniyanar temple, the largest structural temple of the sacred grove; B) Iyanar temple with a low concrete shelter; C) Newly built Muthalraathan temple.

importance of conservation of sacred grove. The vegetation of the sacred grove is characterized by most of the TDEF tree species such as *Atalantia monophylla*, *Garcinia spicata*, *Lepisanthes tetraphylla*, *Memecylon edule* and *Pterospermum canescens*; liana namely *Cissus vitiginea*, *Combretum albidum* and *Reissantia indica* and shrubs include *Canthium coromandelicum*, *Capparis brevispina*, *Carissa spinarum*, *Glycosmis mauritiana*, *Securinega leucopyrus* and *Tarennia asiatica*. It is also an abode for some of the rare plant species such as *Polyalthia korintii*, *Phyllanthus rotundifolius* and *Capparis rotundifolia* (Mitra 1993; Nair and Nayar 1997; Balakrishnan and Chakrabarthy 2007). *Dendrophthoe falcata* is the only parasitic plant species found in the sacred grove, which grows on the branches of *Lannea coromandelica*. *Theriophonum minutum* and *Sansevieria roxburghiana* are the only two plant species that form the ground vegetation of the sacred grove. *Salix tetrasperma*, a typical riparian element is represented only by an individual tree and presence of few individuals of *Calophyllum inophyllum* in the sacred grove are probably the remnants of the past vegetation. Apart, it harbours many psammophytic species such as *Allmania nodiflora*, *Bulbostylis barbata*, *Cleome monophylla*, *Cyperus arenarius*, *Euphorbia rosea*, *Mollugo cerviana* and *M. disticha*. The three *Ficus* species namely *F. amplissima*, *F. benghalensis* and *F. hispida* found in the sacred grove act as keystone species by providing food and shelter for many birds and insects (Figure 7-14).

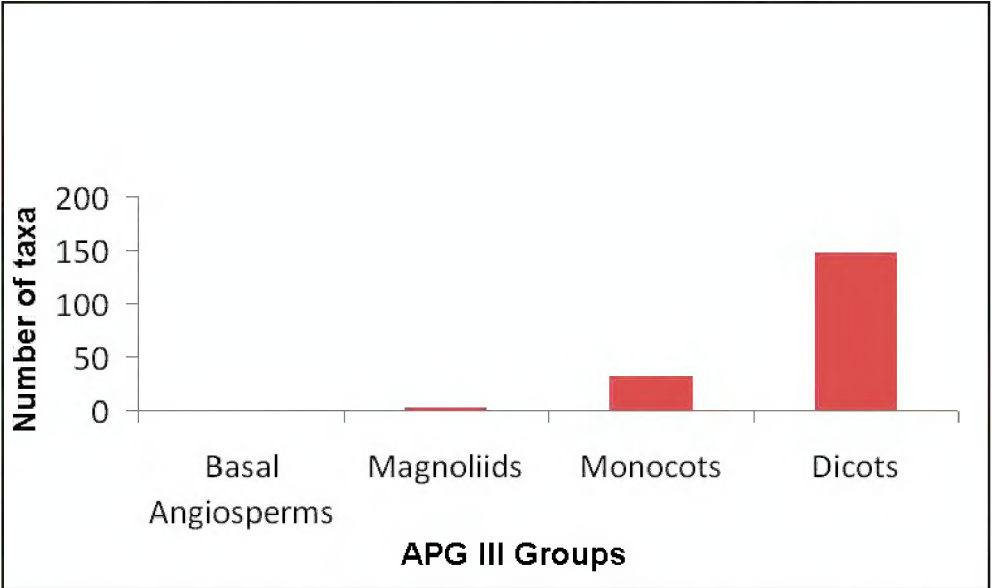


FIGURE 4. Representation of major groups/clade in the flora of Sendirakillai Sacred Grove.

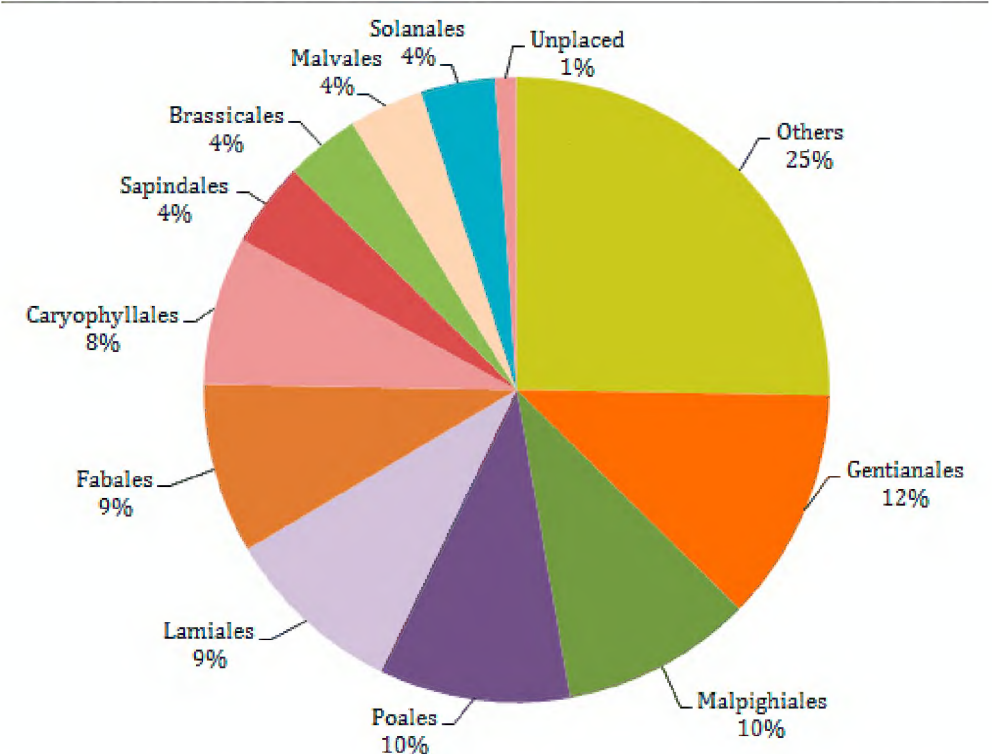


FIGURE 5. Species diversity (in percentage) in various orders of the flora of Sendirakillai Sacred Grove.

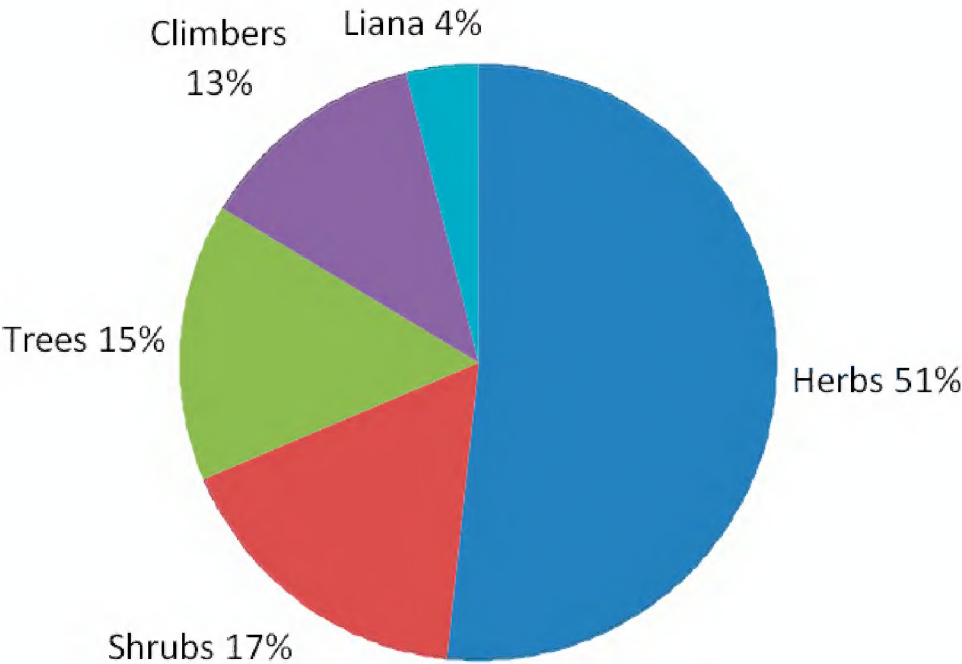


FIGURE 6. Life form composition of Sendirakillai Sacred Grove.

Udayakumar and Parthasarathy (2010) have recorded only 312 taxa from 75 TDEF sites on the Southern Coromandel Coast, whereas during the present study a total of 182 taxa have been recorded from the TDEF of sacred grove proportionately lesser in area cover. It is nearly 60% of the total species diversity of the TDEF vegetation on the Southern Coromandel Coast. A perusal of literature on the phytodiversity of the recently studied neighbourhood sacred groves from Cuddalore, Puducherry and Pudukottai shows that a total of 136 taxa from Olagapuram, 74 from Orani, 55 from Keezhbuvanagiri, 45 from Kilialamman, 40 from Periyakkattupalayam, 36 from Periyamudaaliar chavadi, 136 from Suriampettai and 92 from Kulandaikuppam sacred groves have been reported by various authors (Ramanujam and Kadamban 2001; Ramanujam and Cyril 2003). A comparison of phytodiversity of the SSG with the above mentioned sacred groves reveals that the SSG has the highest plant diversity.

The considerable reduction in the size of the sacred grove is due to encroachment of land for agriculture, floriculture and also for cashew plantation. It seems to be a major factor that destroys the sacred groves and sizable portions of the sacred grove have been cleared in the past and are still being cleared. The firewood is being collected

from the grove only from the dry branches and stump of the lopped trees were also observed in several places of the sacred grove which indicate the anthropogenic disturbance (Figure 15). The vehicular traffic, especially bullock cart and tractor, for carrying the agricultural goods result in gradual expansion of the pathway in the sacred grove. During the present study we also observed a large scale collection of leaves of *Garcinia spicata* in the sacred grove by outsiders for prawn cultivation, which may interfere the growth and reproduction of these trees.

The SSG is a comparatively well-conserved grove covering an area of 3.5 ha. with rich phytodiversity and a proportionately good number of endemics. The high level of species richness is a testimony to the health of the sacred grove. This culturally conserved patch of natural vegetation acts as

- (i) Asylum for relict species;
- (ii) Habitat for endemic and threatened species that require a specific microclimate;
- (iii) Seed bank for the TDEF species;
- (iv) Medicinal treasure for the local communities;
- (v) Habitat for a wide-range of organisms and;
- (vi) Knowledge Centre for the neighborhood community as well for students/researchers in continuing oral traditional knowledge on plants;
- (vii) A centre for social and religious gathering to build relationship among the community members.

Hence it is suggested that SSG may be proposed as a Biodiversity Heritage Site as envisaged by the National Environmental Policy and it has already been initiated by National Biodiversity Authority (NBA) by establishing Biodiversity Management Committee (BMC). The awareness on the importance of the sacred grove needs to be created among the local people for the effective conservation. As Gadgil (1994) emphasized the necessity of National Level Sacred Grove Act for the conservation of sacred groves in India it is inevitable and it is also important to study and map the existing sacred groves in India with the help of Geographical Information System (GIS) to develop effective conservation strategies throughout the country.

TABLE 1. Enumeration of Angiosperms of Sendirakillai Sacred Grove according to Angiosperm Phylogeny Group III Classification (2009) (C – Climber, H – Herb, L – Liana, S – Shrub and T – Tree)

SL NO.	NAME OF ORDERS/FAMILIES		NAME OF SPECIES AND VARIETIES	LIFE FORM	VOUCHER NUMBER
MAGNOLIDS					
Piperales Bercht. and J. Presl					
1	Aristolochiaceae	Aristolochia indica L.		C	GG and PN 6212
Magnoliales Juss. ex Bercht. and J. Presl					
2	Annonaceae Juss.	Polyalthia korintii (Dunal) Thwaites		S	GG and PN 6222
3		Polyalthia suberosa (Roxb.) Thwaites		S	GG and PN 6829
MONOCOTS					
Alismatales R. Br. ex Bercht. and J. Presl					
4	Araceae Juss.	Theriophonum minutum (Willd.) Baill.		H	GG and PN 6296
5	Hydrocharitaceae Juss.	Ottelia alismoides (L.) Pres.		H	GG and PN 6820
Dioscoreales R. Br.					
6	Dioscoreaceae R. Br.	Dioscorea oppositifolia L.		C	GG and PN 6254
7		Dioscorea pentaphylla L.		C	GG and PN 6256

TABLE 1. CONTINUED.

SL NO.	NAME OF ORDERS/FAMILIES	NAME OF SPECIES AND VARIETIES	LIFE FORM	VOUCHER NUMBER
Pandanales R. Br. ex Bercht. and J. Presl				
8	Pandanaceae R. Br.	<i>Pandanus odoratissimus</i> L.f.	S	GG and PN 6856
Liliales Perleb				
9	Liliaceae Juss.	<i>Gloriosa superba</i> L.	H	GG and PN 6268
Asparagales Link				
10	Asparagaceae Juss.	<i>Asparagus racemosus</i> Willd.	C	GG and PN 6240
11		<i>Sansevieria roxburghiana</i> Schult. and Schult.f.	H	GG and PN 6252
COMMELINIDS				
Arecales Bromhead				
12	Arecaceae Bercht. and J. Presl	<i>Borassus flabellifer</i> L.	T	GG and PN 6882
13		<i>Calamus rotang</i> L.	S	GG and PN 6845
14		<i>Phoenix pusilla</i> Gaertn.	S	GG and PN 6857
Commelinales Mirb. ex Bercht. and J. Presl				
15	Commelinaceae Mirb.	<i>Commelina attenuata</i> J. König ex Vahl	H	GG and PN 6860
16		<i>Commelina benghalensis</i> L.	H	GG and PN 6239
17		<i>Cyanotis cristata</i> (L.) D. Don	H	GG and PN 6881
18		<i>Murdannia spirata</i> (L.) Brueck.	H	GG and PN 6286
Poales Small				
19	Cyperaceae Juss.	<i>Bulbostylis barbata</i> (Rottb.) Kunth ex C.B. Clarke	H	GG and PN 6861
20		<i>Cyperus arenarius</i> Retz.	H	GG and PN 6255
21		<i>Cyperus compressus</i> L.	H	GG and PN 6848
22		<i>Cyperus distans</i> L.	H	GG and PN 6285
23		<i>Cyperus rotundus</i> L.	H	GG and PN 6846
24		<i>Fimbristylis dichotoma</i> (L.) Vahl	H	GG and PN 6283
25		<i>Fimbristylis ovata</i> (Burm.f.) Kern	H	GG and PN 6858
26		<i>Kyllinga nemoralis</i> (J.R. and G. Forst.) Dandy ex Hutch. and Dalzell	H	GG and PN 6859
27		<i>Mariscus paniceus</i> (Rottb.) Vahl	H	GG and PN 6864
28		<i>Mariscus squarrosus</i> (L.) C.B. Clarke	H	GG and PN 6282
29	Poaceae Barnhart	<i>Aristida setacea</i> Retz.	H	GG and PN 6257
30		<i>Bambusa bambos</i> (L.) Voss	H	GG and PN 6883
31		<i>Brachiaria ramosa</i> (L.) Stapf	H	GG and PN 6218
32		<i>Eragrostis riparia</i> (Willd.) Nees	H	GG and PN 6863
33		<i>Eragrostis tenella</i> (L.) P. Beauv. ex Roem. and Schult.	H	GG and PN 6210
34		<i>Heteropogon contortus</i> (L.) P. Beauv. ex Roem. and Schult.	H	GG and PN 6865
35		<i>Perotis indica</i> (L.) Kuntze	H	GG and PN 6238
36		<i>Trachys muricata</i> (L.) Pers. ex Trin.	H	GG and PN 6259
EUDICOTS				
Ranunculales Juss. ex Bercht. and J. Presl				
37	Menispermaceae Juss.	<i>Cissampelos pareira</i> L. var. <i>hirsuta</i> (Buch.-Ham. ex DC.) Forman	C	GG and PN 6299
38		<i>Pachygone ovata</i> (Poir.) Miers ex Hook.f. and Thomson	L	GG and PN 6300
39		<i>Tiliacora acuminata</i> (Lam.) Hook.f. and Thomson	L	GG and PN 6814
40		<i>Tinospora cordifolia</i> (Willd.) Miers	L	GG and PN 6203
CORE EUDICOTS				
ROSIDS				
Vitales Juss. ex Bercht. and J. Presl				
41	Vitaceae Juss.	<i>Cayratia pedata</i> (Lam.) A.Juss. ex Gagnep.	C	GG and PN 6804
42		<i>Cissus quadrangularis</i> L.	C	GG and PN 6817
43		<i>Cissus vitiginea</i> L.	L	GG and PN 6824
FABIDS				
Zygophyllales Link				
44	Zygophyllaceae R. Br.	<i>Tribulus lanuginosus</i> L.	H	GG and PN 6812
Celastrales Link				
45	Celastraceae R. Br.	<i>Maytenus emarginata</i> (Willd.) Ding Hou	S	GG and PN 6806
46		<i>Reissantia indica</i> (Willd.) Halle	L	GG and PN 6280
47				



TABLE 1. CONTINUED.

SL NO.	NAME OF ORDERS/FAMILIES	NAME OF SPECIES AND VARIETIES	LIFE FORM	VOUCHER NUMBER
Malpighiales Juss. ex Bercht. and J. Presl				
48	Clusiaceae Lindl.	<i>Calophyllum inophyllum</i> L.	T	GG and PN 6807
49	Clusiaceae Lindl.	<i>Garcinia spicata</i> (Wight and Arn.) Hook.f.	T	GG and PN 6224
50	Euphorbiaceae Juss.	<i>Acalypha lanceolata</i> Willd.	H	GG and PN 6862
51		<i>Breynia vitis-idaea</i> (Burm.f.) C.E.C. Fisch.	S	GG and PN 6288
52		<i>Croton bonplandianum</i> Baill.	H	GG and PN 6272
53		<i>Drypetes sepiaria</i> (Wight and Arn.) Pax and Hoffm.	T	GG and PN 6228
54		<i>Euphorbia rosea</i> Retz.	H	GG and PN 6290
55		<i>Jatropha tanjorensis</i> J.L. Ellis and Saroja	S	GG and PN 6250
56		<i>Securinega leucopyrus</i> (Willd.) Muell.-Arg.	S	GG and PN 6253
57		Linaceae DC. ex Perleb	<i>Hugonia mystax</i> L.	S
58	Ochnaceae DC.	<i>Ochna obtusata</i> DC.	S	GG and PN 6815
59	Passifloraceae Juss. ex Roussel	<i>Passiflora foetida</i> L.	C	GG and PN 6264
60	Phyllanthaceae Martinov	<i>Phyllanthus amarus</i> Schum. and Thonn.	H	GG and PN 6880
61		<i>Phyllanthus debilis</i> Klein. ex Willd.	H	GG and PN 6230
62		<i>Phyllanthus rotundifolius</i> Klein. ex Willd.	H	GG and PN 6216
63		<i>Phyllanthus urinaria</i> L.	H	GG and PN 6217
64	Salicaceae Mirb.	<i>Salix tetrasperma</i> Roxb.	T	GG and PN 6281
65	Violaceae Batsch	<i>Hybanthus enneaspermus</i> (L.) F.v. Muell.	H	GG and PN 6226
Cucurbitales Juss. ex Bercht. and J. Presl				
66	Cucurbitaceae Juss.	<i>Coccinia grandis</i> (L.) Voigt	C	GG and PN 6834
67		<i>Cucumis maderaspatana</i> L.	C	GG and PN 6828
Fabales Bromhead				
68	Fabaceae Lindl.	<i>Abrus precatorius</i> L.	C	GG and PN 6204
69		<i>Alysicarpus monilifer</i> (L.) DC.	H	GG and PN 6867
70		<i>Clitoria ternatea</i> L.	C	GG and PN 6843
71		<i>Crotalaria angulata</i> Mill.	H	GG and PN 6237
72		<i>Dalbergia lanceolaria</i> L.f.	T	GG and PN 6818
73		<i>Desmodium triflorum</i> (L.) DC.	H	GG and PN 6873
74		<i>Dolichos trilobus</i> L.	C	GG and PN 6225
75		<i>Eleiotis sororia</i> DC.	H	GG and PN 6278
76		<i>Indigofera glabra</i> L.	H	GG and PN 6297
77		<i>Mucuna pruriens</i> (L.) DC.	C	GG and PN 6874
78		<i>Pongamia pinnata</i> (L.) Pierre	T	GG and PN 6849
79		<i>Rothia indica</i> (L.) Druce	H	GG and PN 6235
80		<i>Tephrosia purpurea</i> (L.) Pers.	H	GG and PN 6827
81		<i>Zornia gibbosa</i> Span.	H	GG and PN 6236
82		<i>Albizia lebbeck</i> (L.) Willd.	T	GG and PN 6813
83	Polygalaceae Hoffmanns. and Link	<i>Polygala arvensis</i> Willd.	H	GG and PN 6291
Rosales Bercht. and J. Presl				
84	Moraceae Gaudich, nom. cons.	<i>Ficus amplissima</i> Sm.	T	GG and PN 6251
85		<i>Ficus benghalensis</i> L.	T	GG and PN 6842
86		<i>Ficus hispida</i> L.f.	S	GG and PN 6844
86		<i>Streblus asper</i> Lour.	T	GG and PN 6219
87	Rhamnaceae Juss.	<i>Zizyphus oenoplia</i> (L.) Mill.	S	GG and PN 6871
MALVIDS				
Myrtales Juss. ex Bercht. and J. Presl				
88	Combretaceae R. Br.	<i>Combretum albidum</i> G. Don	L	GG and PN 6233
89	Melastomataceae Juss.	<i>Memecylon edule</i> Roxb.	T	GG and PN 6232
90	Myrtaceae Juss.	<i>Syzygium cumini</i> (L.) Skeels	T	GG and PN 6249
91	Onagraceae Juss.	<i>Ludwigia perennis</i> L.	H	GG and PN 6833
Brassicales Bromhead				
92	Capparaceae Juss.	<i>Capparis brevispina</i> DC.	S	GG and PN 6214
93		<i>Capparis rotundifolia</i> Rottler	S	GG and PN 6223



TABLE 1. CONTINUED.

SL NO.	NAME OF ORDERS/FAMILIES	NAME OF SPECIES AND VARIETIES	LIFE FORM	VOUCHER NUMBER
94	Cleomaceae Bercht. and J. Presl	<i>Cleome aspera</i> J. König ex DC.	H	GG and PN 6201
95		<i>Cleome gynandra</i> L.	H	GG and PN 6808
96		<i>Cleome monophylla</i> L.	H	GG and PN 6205
97		<i>Cleome viscosa</i> L.	H	GG and PN 6801
98	Salvadoraceae Lindl.	<i>Azima tetracantha</i> Lam.	S	GG and PN 6298
Malvales Juss. ex Bercht. and J. Presl				
99	Malvaceae Juss.	<i>Corchorus aestuans</i> L.	H	GG and PN 6839
100		<i>Grewia orientalis</i> L.	S	GG and PN 6215
101		<i>Pavonia zeylanica</i> (L.) Cav.	H	GG and PN 6227
102		<i>Pterospermum canescens</i> Roxb.	T	GG and PN 6229
103		<i>Sida acuta</i> Burm.f.	H	GG and PN 6868
104		<i>Sida cordifolia</i> L.	H	GG and PN 6805
105		<i>Triumfetta rhomboidea</i> Jacq.	H	GG and PN 6826
Sapindales Juss. ex Bercht. and J. Presl				
106	Anacardiaceae R. Br.	<i>Anacardium occidentale</i> L.	T	GG and PN 6855
107		<i>Lannea coromandelica</i> (Houtt.) Merr.	T	GG and PN 6872
108	Meliaceae Juss.	<i>Azadirachta indica</i> A. Juss.	T	GG and PN 6803
109	Rutaceae Juss.	<i>Atalantia monophylla</i> (L.) Corrêa	T	GG and PN 6207
110		<i>Glycosmis mauritiana</i> (Lam.) Tanaka	S	GG and PN 6274
111		<i>Pamburus missionis</i> (Wall. ex Wight) Swingle	T	GG and PN 6211
112	Sapindaceae Juss.	<i>Allophylus cobbe</i> (L.) Raeusch.	S	GG and PN 6231
113		<i>Lepisanthes tetraphylla</i> (Vahl) Radlk.	T	GG and PN 6234
Santalales R. Br. ex Bercht. and J. Presl				
114	Loranthaceae Juss.	<i>Dendrophthoe falcata</i> (L.f.) Etting.	H	GG and PN 6213
115	Opiliaceae Valetton	<i>Cansjera rheedei</i> Gmel.	S	GG and PN 6870
Caryophyllales Juss. ex Bercht. and J. Presl				
116	Amaranthaceae Juss.	<i>Achyranthes aspera</i> L.	H	GG and PN 6841
117		<i>Aerva lanata</i> (L.) Juss. ex Schult.	H	GG and PN 6838
118		<i>Allmania nodiflora</i> (L.) R. Br. ex Wight	H	GG and PN 6241
119		<i>Alternanthera sessilis</i> (L.) R. Br. ex DC.	H	GG and PN 6265
120		<i>Pupalia lappacea</i> (L.) Juss.	H	GG and PN 6276
121	Cactaceae Juss.	<i>Acanthocereus tetragonus</i> (L.) Humlk.	H	GG and PN 6847
122		<i>Opuntia striata</i> Haw. var. <i>dillenii</i> (Ker-Gawl.) L.	S	GG and PN 6876
123	Caryophyllaceae Juss.	<i>Polycarpaea corymbosa</i> (L.) Lam.	H	GG and PN 6258
124	Molluginaceae Bartl.	<i>Gisekia pharnaceoides</i> L.	H	GG and PN 6287
125		<i>Mollugo cerviana</i> (L.) Ser.	H	GG and PN 6269
126		<i>Mollugo disticha</i> (L.) Ser.	H	GG and PN 6292
127		<i>Mollugo pentaphylla</i> L.	H	GG and PN 6866
128	Nyctaginaceae Juss.	<i>Boerhavia diffusa</i> L.	H	GG and PN 6816
129	Portulacaceae Juss.	<i>Portulaca pilosa</i> L.	H	GG and PN 6284
ASTERIDS				
Ericales Bercht. and J. Presl				
130	Ebenaceae Gürke	<i>Diospyros ferrea</i> (Willd.) Bakh.	S	GG and PN 6266
131	Lecythidaceae A. Rich.	<i>Barringtonia acutangula</i> (L.) Gaertn.	T	GG and PN 6875
132	Sapotaceae Juss.	<i>Madhuca longifolia</i> (J. König) J.F. Macbr.	T	GG and PN 6821
LAMIIDS				
133	Boraginaceae Juss.	<i>Carmona retusa</i> (Vahl) Masamune	S	GG and PN 6809
134	Icacinaceae Miers	<i>Pyrenacantha volubilis</i> Wight	C	GG and PN 6221
Gentianales Juss. ex Bercht. and J. Presl				
135	Apocynaceae Juss.	<i>Carissa spinarum</i> L.	S	GG and PN 6837
136		<i>Calotropis gigantea</i> (L.) R. Br.	S	GG and PN 6267
137		<i>Ceropegia candelabrum</i> L.	C	GG and PN 6851
138		<i>Hemidesmus indicus</i> (L.) W.T. Aiton	H	GG and PN 6822
139		<i>Ichnocarpus frutescens</i> (L.) R. Br.	C	GG and PN 6273



TABLE 1. CONTINUED.

SL NO.	NAME OF ORDERS/FAMILIES	NAME OF SPECIES AND VARIETIES	LIFE FORM	VOUCHER NUMBER
140	Apocynaceae Juss.	<i>Leptadenia reticulata</i> (Retz.) Wight and Arn.	C	GG and PN 6275
141		<i>Thevetia peruviana</i> (Pers.) Merr.	S	GG and PN 6835
142		<i>Tylophora indica</i> (Burm.f.) Merr.	C	GG and PN 6878
143	Loganiaceae R. Br. ex Mart.	<i>Strychnos lenticellata</i> Hill	L	GG and PN 6263
144		<i>Strychnos potatorum</i> L.f.	T	GG and PN 6262
145	Rubiaceae Juss.	<i>Canthium coromandelicum</i> (Burm.f.) Alston	S	GG and PN 6877
146		<i>Hedyotis corymbosa</i> (L.) Lam.	H	GG and PN 6261
147		<i>Hedyotis graminifolia</i> L.f.	H	GG and PN 6246
148		<i>Hedyotis puberula</i> (G. Don) R. Br. ex Arn.	H	GG and PN 6260
149		<i>Ixora pavetta</i> T. Anderson	T	GG and PN 6825
150		<i>Morinda pubescens</i> Sm.	T	GG and PN 6270
151		<i>Pavetta indica</i> L.	S	GG and PN 6271
152		<i>Psilanthus wightianus</i> (Wight and Arn.) Leroy	S	GG and PN 6244
153		<i>Psydrax dicoccos</i> Gaertn.	T	GG and PN 6243
154		<i>Spermacoce articularis</i> L.	H	GG and PN 6810
155		<i>Spermacoce hispida</i> L.	H	GG and PN 6279
156		<i>Tarenna asiatica</i> (L.) Kuntze ex K. Schum.	S	GG and PN 6242
Lamiales Bromhead				
157	Acanthaceae Juss.	<i>Asystasia gangetica</i> (L.) T. Anderson	H	GG and PN 6823
158		<i>Blepharis maderaspatensis</i> (L.) B. Heyne ex Roth	H	GG and PN 6245
159		<i>Justicia adhatoda</i> L.	S	GG and PN 6852
160		<i>Justicia prostrata</i> (Roxb. ex C.B. Clarke) Gamble	H	GG and PN 6830
161		<i>Justicia tranquebariensis</i> L.f.	H	GG and PN 6220
162		<i>Ruellia prostrata</i> Poir.	H	GG and PN 6854
163	Lamiaceae Martinov	<i>Basilicum polystachyon</i> (L.) Moench	H	GG and PN 6802
164		<i>Hyptis suaveolens</i> (L.) Poit.	H	GG and PN 6206
165		<i>Leucas diffusa</i> Benth.	H	GG and PN 6202
166	Oleaceae Hoffmanns. and Link	<i>Jasminum angustifolium</i> (L.) Willd.	C	GG and PN 6208
167	Pedaliaceae R. Br.	<i>Pedaliium murex</i> L.	H	GG and PN 6209
168	Scrophulariaceae Juss.	<i>Limnophylla polystachya</i> Benth.	H	GG and PN 6819
169		<i>Lindernia crustacea</i> (L.) F.v. Muell.	H	GG and PN 6831
170		<i>Lindernia oppositifolia</i> (Retz.) Mukh.	H	GG and PN 6832
171		<i>Scoparia dulcis</i> L.	H	GG and PN 6811
172	Verbenaceae J. St.-Hil.	<i>Phyla nodiflora</i> (L.) Greene	H	GG and PN 6850
173		<i>Premna latifolia</i> Roxb.	T	GG and PN 6247
Solanales Juss. ex Bercht. and J. Presl				
174	Convolvulaceae Juss.	<i>Argyreia cymosa</i> (Roxb.) Sweet	C	GG and PN 6293
175		<i>Evolvulus alsinoides</i> (L.) L.	H	GG and PN 6277
176		<i>Evolvulus nummularius</i> (L.) L.	H	GG and PN 6853
177		<i>Ipomoea pes-tigridis</i> L.	C	GG and PN 6289
178		<i>Merremia tridentata</i> (L.) Hall.f.	H	GG and PN 6294
179		<i>Rivea hypocrateriformis</i> (Desr.) Choisy	C	GG and PN 6840
180	Solanaceae Juss.	<i>Physalis angulata</i> L.	H	GG and PN 6879
COMPANULIDS				
Asterales Link				
181	Asteraceae Bercht. and J. Presl	<i>Cyanthillium cinereum</i> (L.) H. Rob.	H	GG and PN 6295
182		<i>Emilia sonchifolia</i> (L.) DC.	H	GG and PN 6248

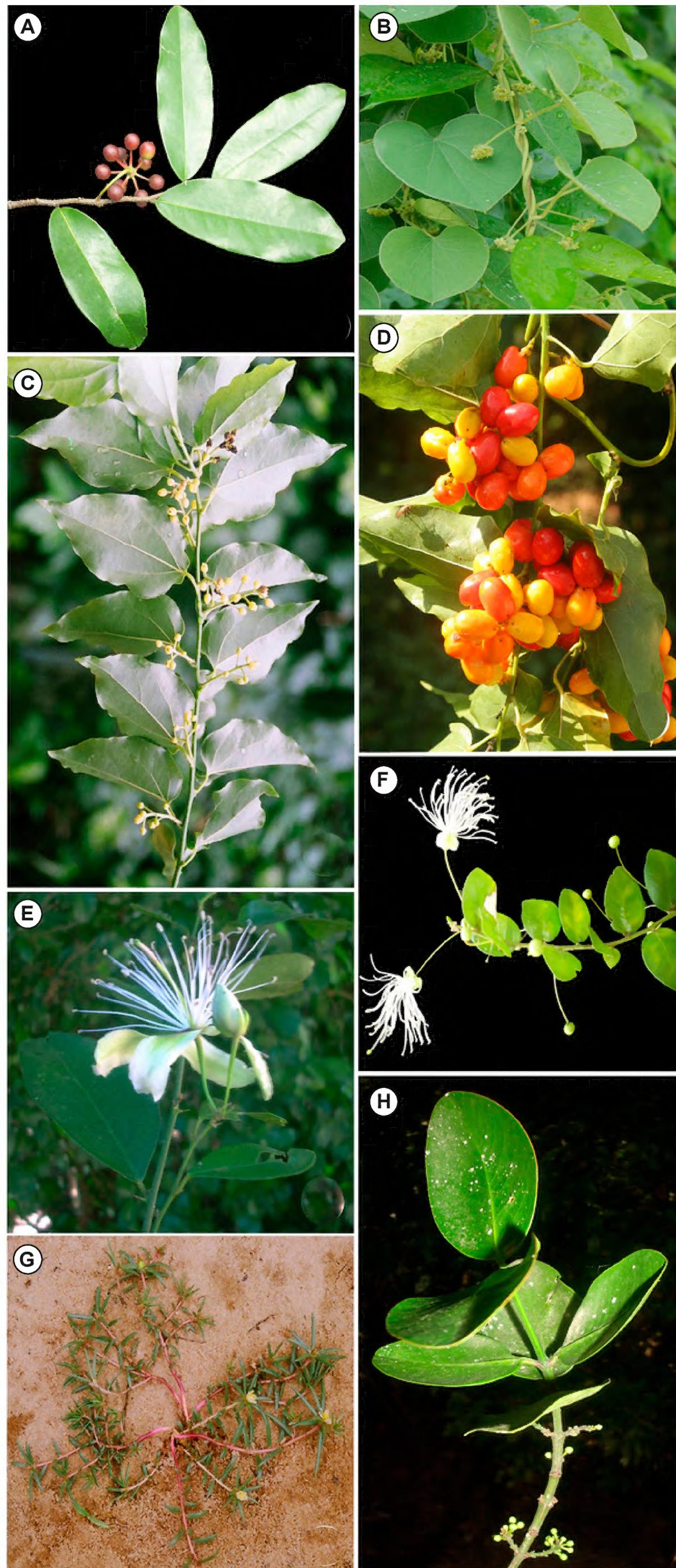


FIGURE 7. A) *Polyalthia suberosa* (Annonaceae) – a common tree; B) *Cissampelos pareira* (Menispermaceae) – a rare climber; C and D) *Tiliacora acuminata* (Menispermaceae) – a rare liana with bright red fruits ; E) *Capparis brevispina* (Capparaceae) – a common shrub with yellow tinged white flower; F) *Capparis rotundifolia* (Capparaceae) – an endemic shrub of peninsular India and Sri Lanka ; G) *Portulaca pilosa* (Portulacaceae) – a common psammophyte ; H) *Garcinia spicata* (Clusiaceae) – a common tree, leaves are used for prawn cultivation.

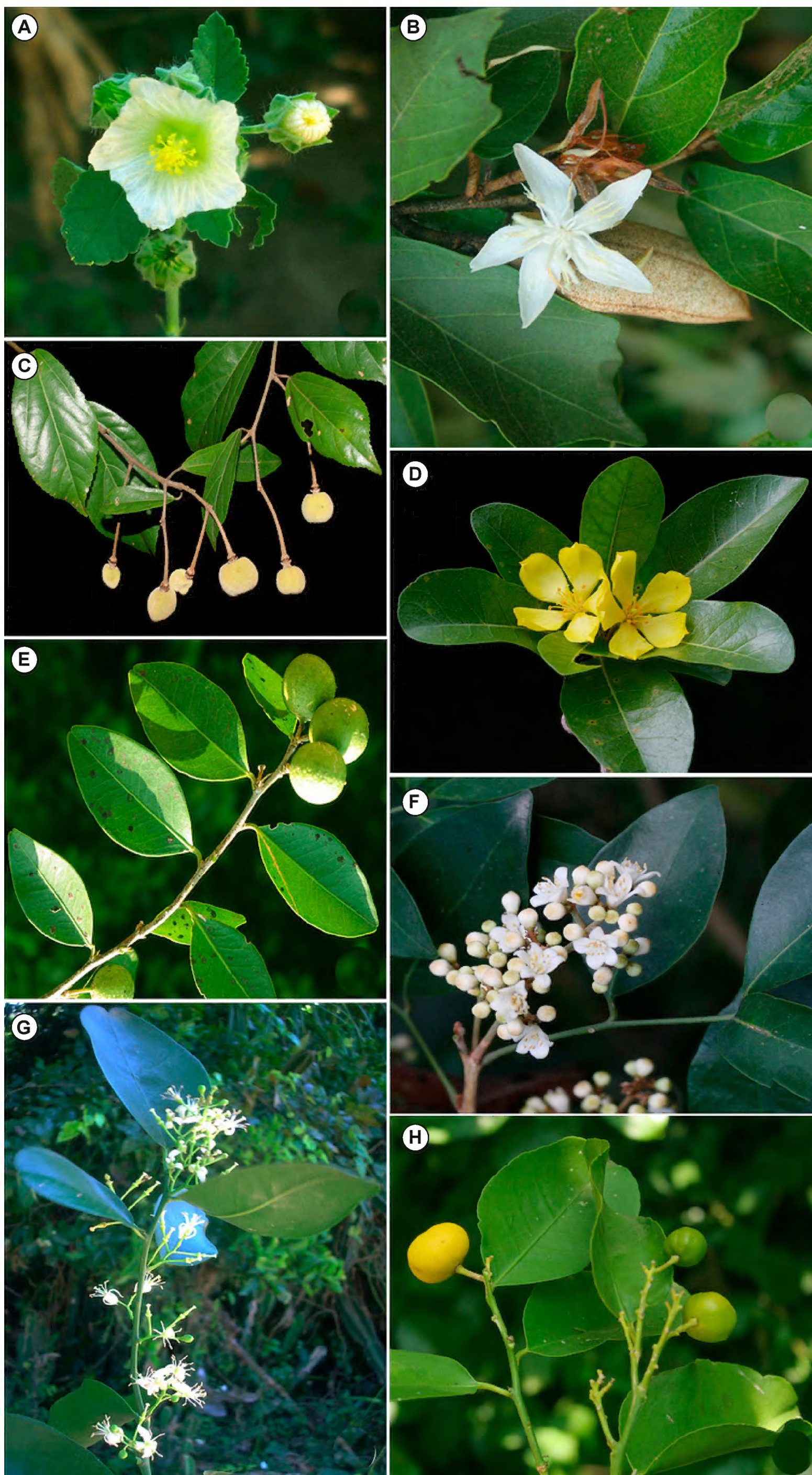


FIGURE 8. A) *Sida cordifolia* (Malvaceae) – a common weed; B) *Pterospermum canescens* (Malvaceae) – a common and characteristic tree species of TDEF; C) *Grewia orientalis* (Malvaceae) – a common liana; D) *Hugonia mystax* (Linaceae) – a rare shrub; E) *Atalantia monophylla* (Rutaceae) – a common tree; F) *Glycosmis mauritiana* (Rutaceae) – a common shrub; G and H) *Pamburus missionis* (Rutaceae) – an endemic tree of peninsular India and Sri Lanka.

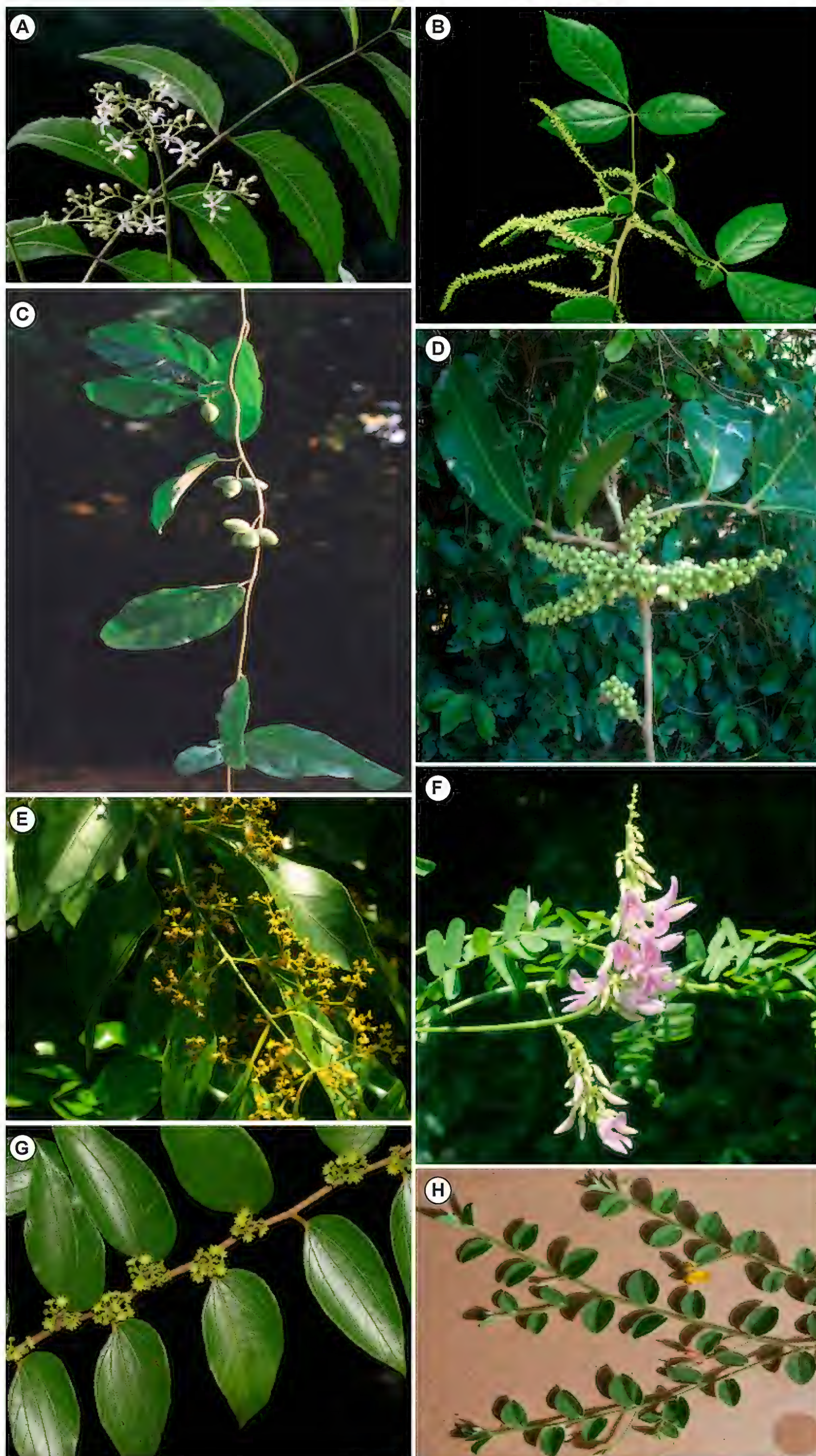


FIGURE 9. A) *Azadirachta indica* (Meliaceae) – leaves are used for ear infection and wound healing; B) *Pyrenacantha volubilis* (Icacinaceae) – a common climber in sacred grove but uncommon elsewhere; C) *Reissantia indica* (Celastraceae) – a common liana; D) *Ziziphus oenoplia* (Rhamnaceae) – fruits are edible; E) *Allophylus cobbe* (Sapindaceae) – a common shrub; F) *Lepisanthes tetraphylla* (Sapindaceae) – a common and characteristic tree of TDEF; G) *Abrus precatorius* (Fabaceae) – a common climber; H) *Crotalaria angulata* (Fabaceae) – a common prostrate herb.



FIGURE 10. A) *Dalbergia lanceolaria* (Fabaceae) – a rare tree; B) *Syzygium cumini* (Myrtaceae) – the oldest and biggest tree of the sacred grove found at the back of Iyanar deity (510 cm GBH); C and D) *Memecylon edule* (Melastomataceae) – a characteristic and dominant tree of TDEF; E) *Passiflora foetida* (Passifloraceae) – a rare climber found along the canal; F) *Coccinia grandis* (Cucurbitaceae) – a common climber.

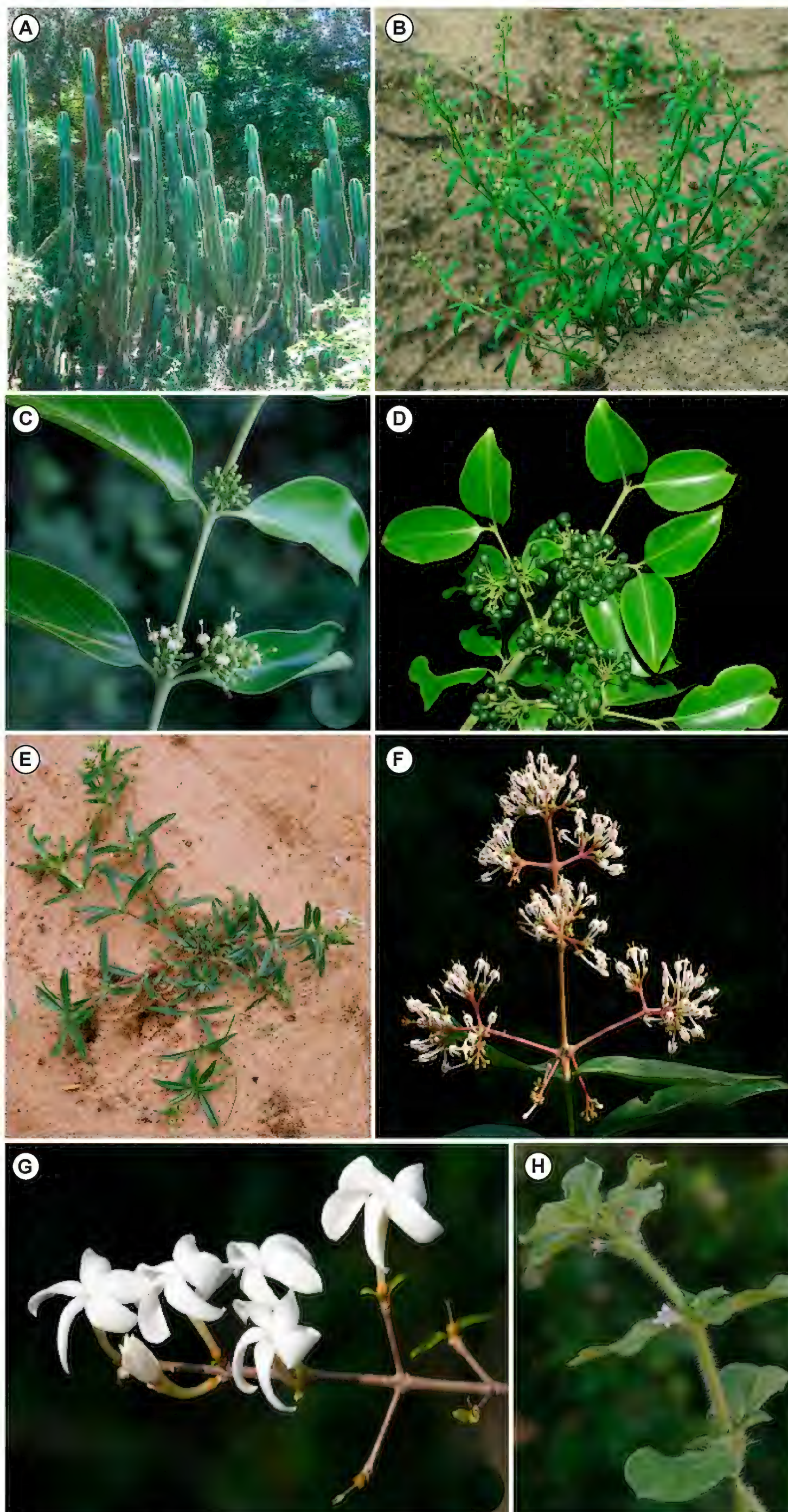


FIGURE 11. A) *Acanthocereus tetragonus* (Cactaceae) – an introduced cactus used for fencing; B) *Mollugo disticha* (Molluginaceae) – a common psammophyte; C and D) *Psydrax dicoccus* (Rubiaceae) – a common tree; E) *Hedyotis puberula* (Rubiaceae) – a common prostrate herb; F) *Ixora pavetta* (Rubiaceae) – a common tree of sacred grove found along the canal; G) *Psilanthus wightianus* (Rubiaceae) – a rare shrub flowers profusely immediately after summer rain ; H) *Spermacoce hispida* (Rubiaceae) – a common psammophyte.

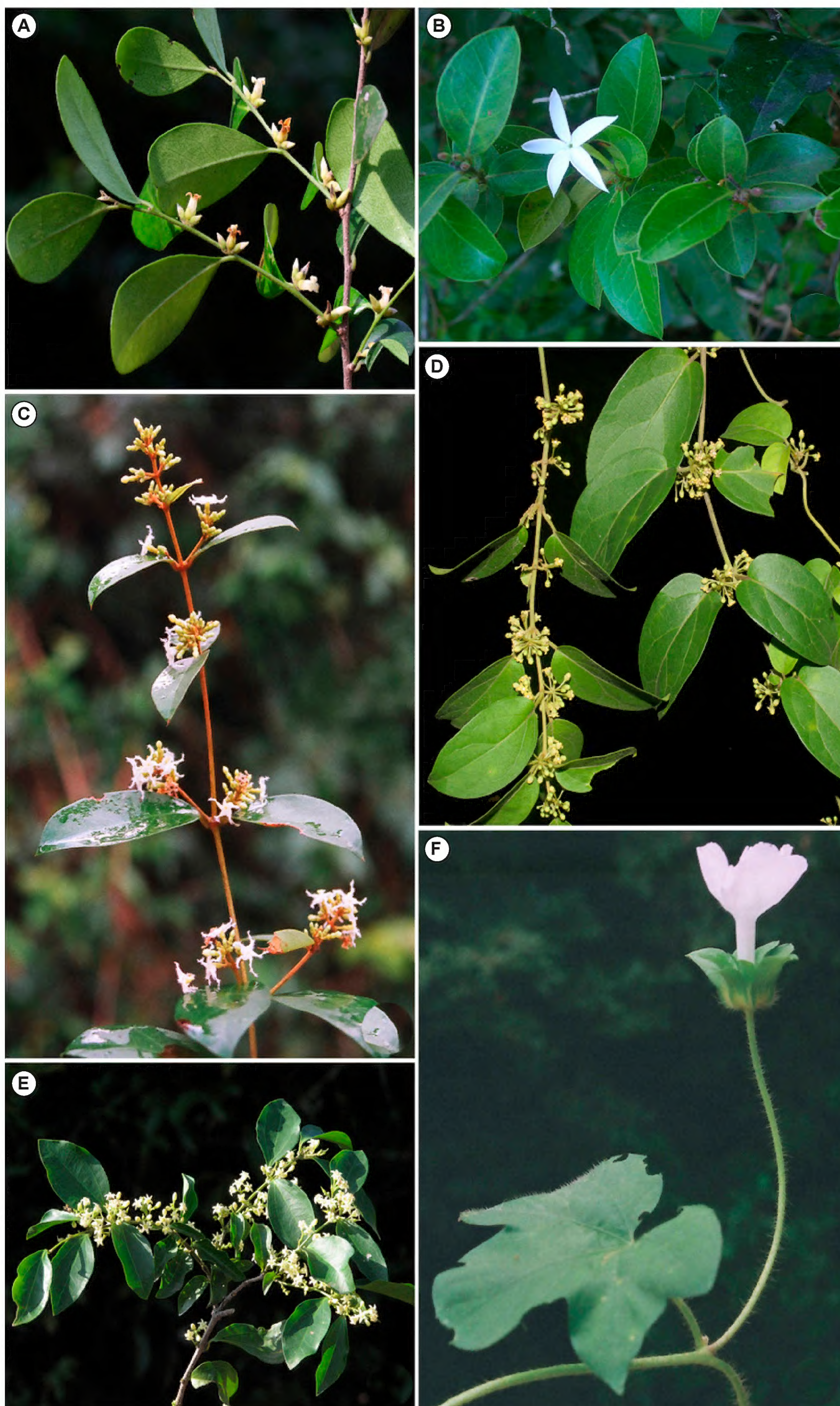


FIGURE 12. A) *Diospyros ferrea* (Ebenaceae) – a shrub common in TDEF; B) *Carissa spinarum* (Apocynaceae) – a rare shrub, fruits are edible; C) *Ichnocarpus frutescens* (Apocynaceae) – a rare climber ; D) *Tylophora indica* (Apocynaceae) – leaves and roots are used for common cough and asthma; E) *Strychnos lenticellata* (Loganiaceae) – a dominant liana; F) *Ipomoea pes-tigridis* (Convolvulaceae) – a rare climber.

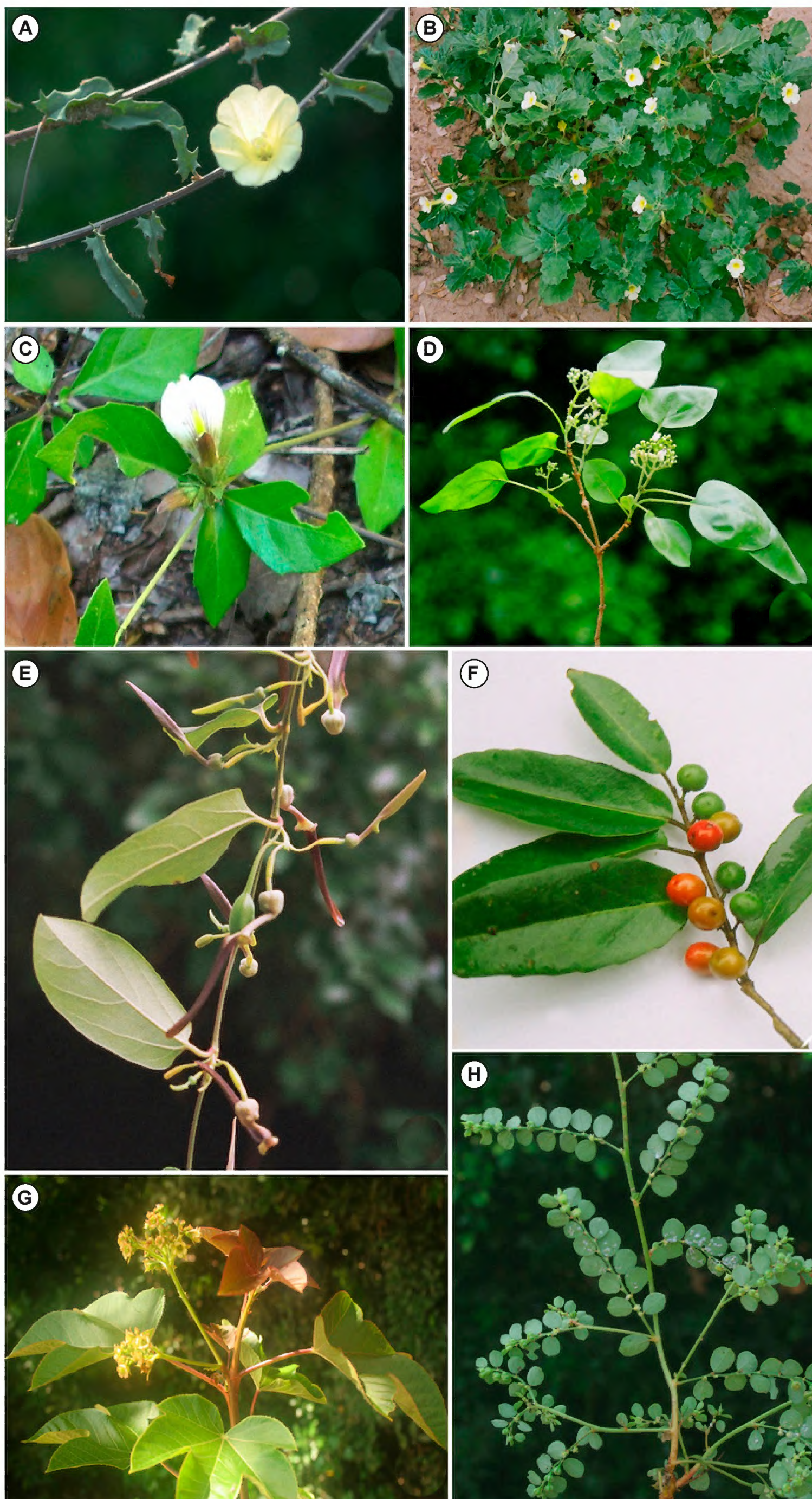


FIGURE 13. A) *Merremia tridentata* (Convolvulaceae) - a common prostrate herb; B) *Pedalium murex* (Pedaliaceae) - a common psammophyte; C) *Blepharis maderaspatensis* (Acanthaceae) - leaves used as a bone-setter and tonic; D) *Premna latifolia* (Verbenaceae) - a common much branched tree, pollinated by butterflies; E) *Aristolochia indica* (Aristolochiaceae) - a rare climber, leaves and roots are used for snake bite and skin disease; F) *Drypetes sepiaria* (Euphorbiaceae) - a rare slow growing tree of TDEF; G) *Jatropha tanjorensis* (Euphorbiaceae) - an endemic shrub of India; H) *Phyllanthus rotundifolius* (Phyllanthaceae) - a rare psammophytic herb.



FIGURE 14. A) *Ottelia alismoides* (Hydrocharitaceae) – a common aquatic herb in the canal; B) *Sansevieria roxburghiana* (Agavaceae) – an endemic herb to India; C) *Dioscorea oppositifolia* (Dioscoreaceae) – a common climber tubers are edible; D) *Pandanus odoratissimus* (Pandanaceae) – a common shrub; E) *Theriophonum minutum* (Araceae) – a common annual herb whose tubers are processed and eaten; F) *Perotis indica* (Poaceae) – a common psammophytic grass; G) *Trachys muricata* (Poaceae) – a common psammophytic grass.



FIGURE 15. A) Encroachment at the Western periphery of the Sacred Grove by Cashew Plantation; B) Fire wood collected from the Sacred Grove; C) Building a new anthropomorphic god (Pillaiyar).

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